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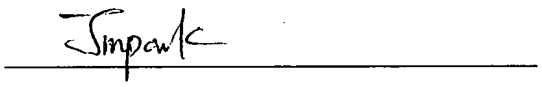
NAME OF THE TRANSLATOR : Jong-Mi PARK

SIGNATURE : 

Date : February 2, 2004

RESIDENCE : MIHWA BLDG., 110-2, MYONGRYUN-DONG 4-GA, CHONGRO-GU, SEOUL 110-524, KOREA

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Translation of Priority Document

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[ABSTRACT OF THE DISCLOSURE]

[ABSTRACT]

A method for enabling a first terminal on a packet-based network to communicate with a second terminal accessing a remote access server, comprises the steps of registering the aliases and IP (Internet Protocol) addresses of the first terminal and remote access server into the gatekeeper, letting the first terminal send to the gatekeeper a message for requesting a connection with the second terminal, causing the gatekeeper to request the remote access server to connect with the second terminal even not registered in the gatekeeper, causing the remote access server to request the second terminal to register its alias and IP address in the gatekeeper, and establishing communication between the first and second terminals through the gatekeeper.

[REPRESENTATIVE FIGURE]

FIG. 5

[INDEX]

IP NETWORK, REMOTE ACCESS SERVER, GATEWAY, GATE KEEPER

[SPECIFICATION]

[TITLE OF INVENTION]

METHOD OF ESTABLISHING COMMUNICATION EXCHANGE BETWEEN A TERMINAL OF A PACKET-BASED NETWORK AND A TERMINAL

CONNECTED TO A REMOTE ACCESS SERVER

[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 is a diagram for illustrating the structure of a communication network for a terminal connected to PSTN or ISDN to make a dial-up connection with an IP network through a remote access server;

Fig. 2 is diagram for illustrating a communication network recommended in H.323 of ITU-T;

Fig. 3 is a flow diagram for illustrating the flowing of messages between terminals in an H.323 network;

Fig. 4 is the combined network comprising the networks of Figs. 1 and 2; and

Fig. 5 is a flow diagram for illustrating the process of connecting a terminal on an IP network and a terminal accessing a remote access server according to the present invention.

[DETAILED DESCRIPTION OF THE PRESENT INVENTION]

[OBJECT OF THE INVENTION]

[RELATED FIELD AND PRIOR ART OF THE INVENTION]

The present invention relates to a method of establishing communication exchange between a terminal of an IP (Internet Protocol) network and a terminal connected through PPP (Point to Point Protocol) to a remote access server, and more particularly a communication protocol between a gatekeeper and a remote access server.

Fig. 1 illustrates a network structure for enabling a terminal C 12 connected with PSTN (Public Switched Telephone Network) or ISDN (Integrated Service Digital Network) 10 to access an IP network through dial-up connection to a remote access server 20. In this case, the terminal C 12 makes a PPP connection with the remote access server 20, assigned with an IP address, so that it may exchange packet data with a particular host through the IP network 30.

Fig. 2 is a network structure as recommended by ITU-T (International Telecommunication Union-Telecommunication Standardization Sector) in H.323 (Packet-based Multimedia Communications System). The ITU-T H.323 provides a standard for enabling the H.323 terminals to make multimedia communication with each other in a packet-based network such as IP network, defining the entities of gatekeeper 38, terminal 32, 36, gateway 34, and MCU (Multipoint Control Unit, not shown), and a communication protocol between these entities. According to this protocol, the terminals should register their aliases and IP addresses in the gatekeeper 38, and receive admission from it for making communication with each other. The protocol used for this consists of RAS (Registration, Admission, and Status) and Q.931 of ITU-T H.225.0 (Line Transmission of Non-Telephone Signals).

Fig. 3 is a flow diagram for illustrating the process of exchanging messages to enable a terminal A to make a connection to a terminal B in the H.323 network. Firstly, the terminals send RRQ (Registration Request) messages to the gatekeeper to register their aliases (a kind of telephone number) and IP addresses in steps 50-1 and 50-3, and then receive RCF (Registration Confirm) messages in steps 50-2 and 50-4, so that they

may communicate with each other through the IP addresses retrieved from the gatekeeper according to the aliases. Simultaneously with retrieving the IP address of the receiving terminal, the sending terminal exchanges ARQ (Admission Request) message and ACF (Admission Confirm) message with the gatekeeper respectively in steps 50-5 and 50-6 in order to receive the admission for communication. Receiving the ACF message from the gatekeeper, the sending terminal A sends in step 50-7 Q931 setup message for call signaling to the receiving terminal B, as shown in Fig. 3. Then, the receiving terminal B likewise exchanges ARQ message and ACF message with the gatekeeper respectively in steps 50-8 and 50-9 in order to receive the admission for communication. Receiving the ACF message from the gatekeeper, the receiving terminal B sends in step 50-10 Q931 connection message to the sending terminal A, performing H.245 call signaling to establish communication in step 50-11.

Referring to Fig. 4 for illustrating the structure of a combined network comprising the networks of Figs. 1 and 2, the terminal C 12 accesses the remote access server 20 to communicate with a particular H.232 terminal such as terminal A 32 or B 36 connected with the IP network 30. Of course, connected to the IP network 30, the terminal C 12 should register its alias and IP address in the gatekeeper 38, and then receive the admission for communication.

Thus, while the terminal C 12 maintains such dial-up connection with the remote access server 20 with the help of a mode, the terminals on the IP network 30 may communicate with the terminal C 12 at any time. However, the terminal C 12 usually maintains off-line from the remote access server 20 due to the cost of dial-up

modem connection when it does not require communication with the IP network 30. Terminating dial-up connection with the remote access server 20, the terminal C 12 loses its IP address, and its registered information in the gatekeeper 38 becomes ineffective, so that the terminals on the IP network cannot connect with the terminal C in a circuit network such as PSTN.

[SUBSTANTIAL MATTER OF THE INVENTION]

It is an object of the present invention to provide a method for enabling a first terminal on an IP network to communicate with a second terminal accessing a remote access server even when the second terminal terminates the dial-up connection with the remote access server.

According to an aspect of the present invention, a method for enabling a first terminal on a packet-based network to communicate with a second terminal accessing a remote access server, comprises the steps of registering the aliases and IP (Internet Protocol) addresses of the first terminal and remote access server into the gatekeeper, letting the first terminal send to the gatekeeper a message for requesting a connection with the second terminal, causing the gatekeeper to request the remote access server to connect with the second terminal even not registered in the gatekeeper, causing the remote access server to request the second terminal to register its alias and IP address in the gatekeeper, and establishing communication between the first and second terminals through the gatekeeper.

[CONSTRUCTION AND OPERATION OF THE INVENTION]

The present invention will now be described more specifically with reference to the drawings attached only by way of example.

The present invention provides a communication protocol between the gatekeeper and the remote access server according to a message flow as shown in Fig. 5, where the message syntax and data structure comply with ASN.1 (Abstract Syntax Notation No.1) as shown in Table 1.

Table 1

```
ModemGWInfo = SEQUENCE
{
    dataRatesSupported    SEQUENCE OF DataRate,
    supportedPrefixes     SEQUENCE OF SupportedPrefix
    ......
}
```

```
ModemMessage    = CHOICE
{
    modemDialOutRequest     ModemDialOutRequest,
    modemDialOutConfirm     ModemDialOutConfirm,
    modemDialOutReject      ModemDialOutReject,
    modemDialOutProgress    ModemDialOutProgress
```

```
}
ModemDialOutRequest    = SEQUENCE    -- MRQ
{
      destAlias                  AliasAddress,
      timeToWait                 INTEGER(0...256) OPTIONAL      -- in seconds
}
ModemDialOutConfirm    = SEQUENCE    -- MCF
{
      endpointIdentifier       EndpointIdentifier,
      destRasAddress               TransportAddress OPTIONAL
}
ModemDialOutReject    = SEQUENCE      -- MRJ
{
      endpointIdentifierEndpointIdentifier,
      rejectReason                 ModemDialOutRejectReason
}
ModemDialOutRejectReason    = CHOICE
{
      resourceUnavailable     NULL,              -- no available port
      destinationBusy             NULL,          -- destination is busy
      ......
```

```
}
ModemDialOutProgress    = SEQUENCE    -- MIP
{
endpointIdentifierEndpointIdentifier,
}
```

The terminology used in Table 1 complies with ITU-T H.323 and H.225.0 Ver. 2, except for MRQ (ModemDialOut Request), MCF (ModemDialOut Confirm), MRJ (ModemDialOut Reject) and MIP (ModemDialOut in Progress), which have been proposed by the present invention, exchanged by using "nonStandardData" of "NonStandardMessage" of H.225.0 RAS. In addition, there has been proposed a data structure defined by "modemGWInfo" used in "terminalType" in the conventional RRQ message.

MRQ is a message sent by the gatekeeper to the remote access server when the gatekeeper receives ARQ from a first terminal requesting a connection with a second terminal not registered in the gatekeeper but to be connected through the remote access server. The MRQ message contains the telephone number "destAlias" of the second terminal, and the time limit "timeToWait" for waiting a response to the MRQ message.

MCF is a message for notifying the gatekeeper that the remote access server has made a PPP connection with the second terminal and assigned an IP address thereto in response to the MRQ message. The assigned IP address may be included in

"destRasAddress".

MRJ is a message for notifying the gatekeeper that the remote access server cannot make a connection with the second terminal in response to the MRQ message. The reject reason is included in "rejectReason".

MIP is a message for notifying the gatekeeper that the remote access server is in progress for making a connection with the second terminal when it cannot send a message responding to MRQ until "timeToWait".

Referring to Fig. 5, the terminal A on the IP network and remote access server send RRQ messages to register their aliases and IP addresses respectively in steps 60-1 and 60-2. In this case, the remote access server designates "terminalType" for the gateway in the RRQ message. The gateway is defined by a data structure "GatewayInfo", whose "nonStandardData" is used for notifying its information. The "nonStandardData" is defined by a structure "nonStandardParameter" consisting of "nonStandardIdentifier" and data. The "nonStandardIdentifier is defined by a structure "NonStandardIdentifier" consisting of object or "h221NonStandard". The object is used to designate the object identifier of the remote access server. The data of "NonStandardParameter" employs a structure "ModemGWInfo" as shown in Table 1. The other fields of the RRQ message are the same as in the other terminals.

Thereafter, if the gatekeeper sends RCF message for notifying the terminal A and remote access server of the registration completed respectively in steps 60-1 and 60-2, the terminal A sends ARQ message to the gatekeeper in order to communicate with the terminal B, in step 60-3. Detecting the alias of the terminal B contained in the ARQ

message, the gatekeeper sends in step 60-4 MRQ message to the remote access server, so that the remote access server attempts to make a dial-up PPP connection with the terminal B in step 60-6. In this case, if there is no available port or the terminal B is busy, the remote access server sends MRJ message to the gatekeeper in step 60-7. As the remote access server attempts to make the PPP connection with the terminal B, it sends MIP message to the gatekeeper at the time interval specified in the MRQ message in step 60-5. Accomplishing the PPP connection with assigning the IP address, the remote access server sends MCF message to the gatekeeper in 60-7.

Subsequently, while the gatekeeper waits registration of the terminal B, the terminal B sends GRQ (Gatekeeper Request) message to seek the gatekeeper for registration. Receiving GCF (Gatekeeper Confirm) from the gatekeeper in step 60-8, the terminal B sends RRQ message to the gatekeeper to register the alias and IP address. Then, the gatekeeper sends RCF message to confirm the registration of the terminal B in step 60-9.

Then, the gatekeeper sends ACF to the terminal A to admit the communication in step 60-10. The subsequent message flow complies with the specification of H.323. Namely, as shown in Fig. 5, if the terminal A, receiving the ACF message, sends Q931 setup message for call signaling to the terminal B in step 60-11, the terminal B sends ARQ message to the gatekeeper for receiving admission of communication in step 60-12. Receiving ACF message from the gatekeeper in step 60-13, the terminal B sends Q931 connection message to the terminal A in step 60-14. Finally, performing H.245 call signaling, the communication is established in step 60-15.

The termination of the communication is as defined in the specification of H.323.

While the present invention has been described in connection with specific embodiments accompanied by the attached drawings, it will be readily apparent to those skilled in the art that various changes and modifications may be made thereto without departing the gist of the present invention.

[EFFECT OF THE INVENTION]

Thus, the invention provides means for enabling the H.323 terminal on the IP network to establish as desired communication with a terminal on PSTN or ISDN that is not presently connected with the remote access server, by exchanging controlling messages between the gatekeeper and remote access server. In addition, the inventive method employs the conventional H.225.0 RAS message according to the international standard, thereby providing compatibility with the conventional communication system.

Moreover, a terminal on PSTN or ISDN may be called by a terminal on the IP network even in off-line with the remote access server, and therefore, saves the cost taken for maintaining on-line with the remote access server.

FIG. 1

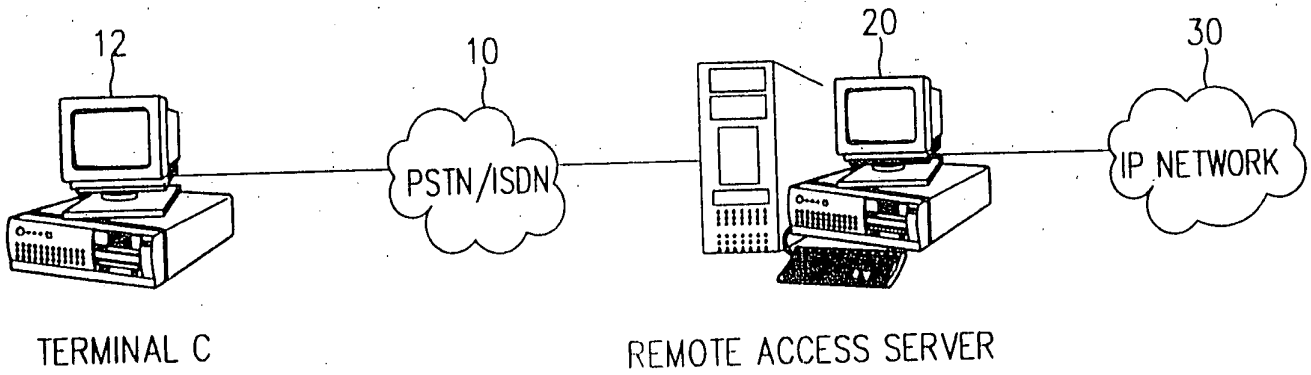
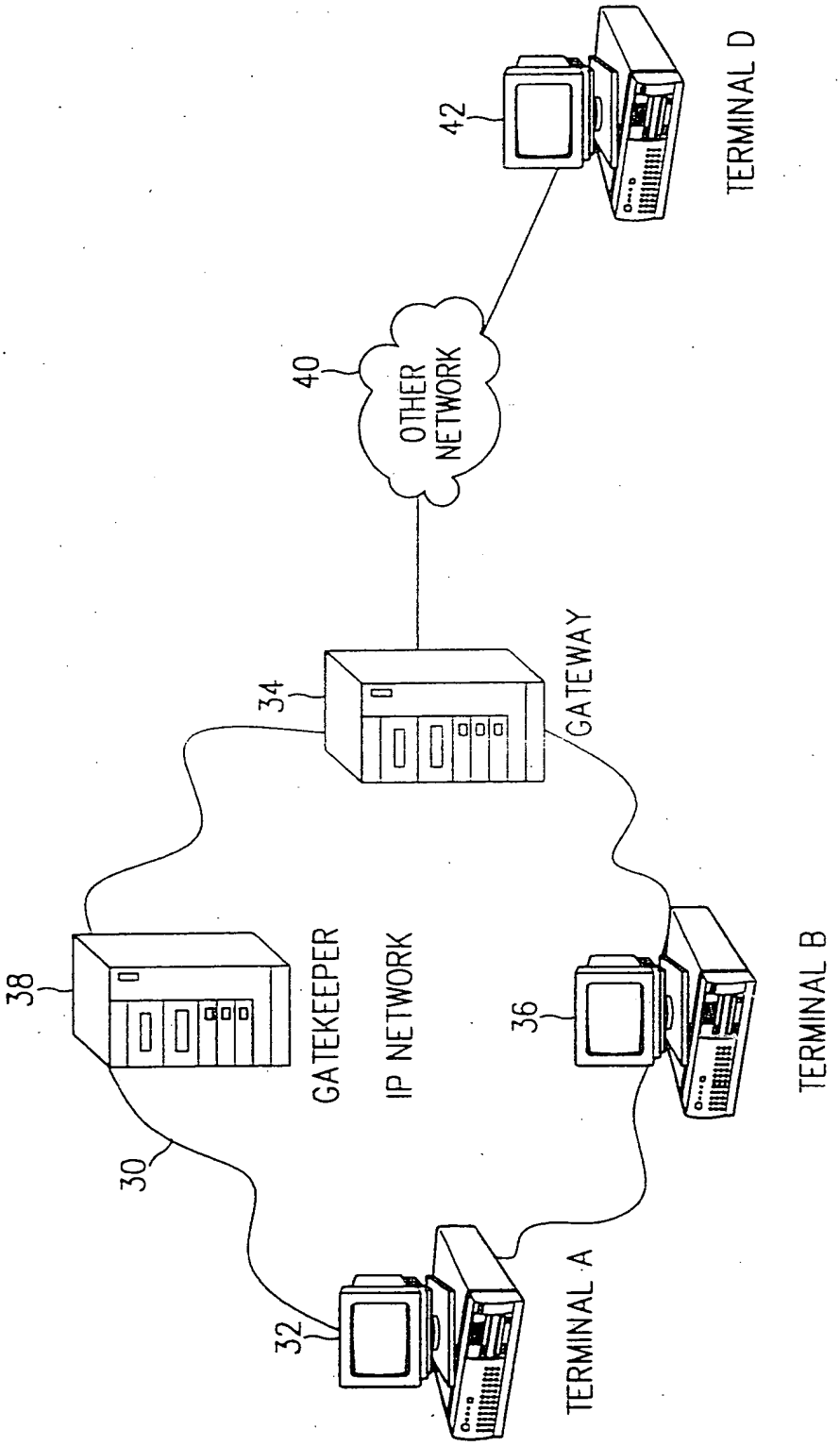

12
10
20
30
PSTN/ISDN
IP NETWORK
TERMINAL C
REMOTE ACCESS SERVER

FIG. 2


TERMINAL D
42
OTHER NETWORK
40
GATEWAY
34
GATEKEEPER
IP NETWORK
38
TERMINAL B
36
TERMINAL A
32
30

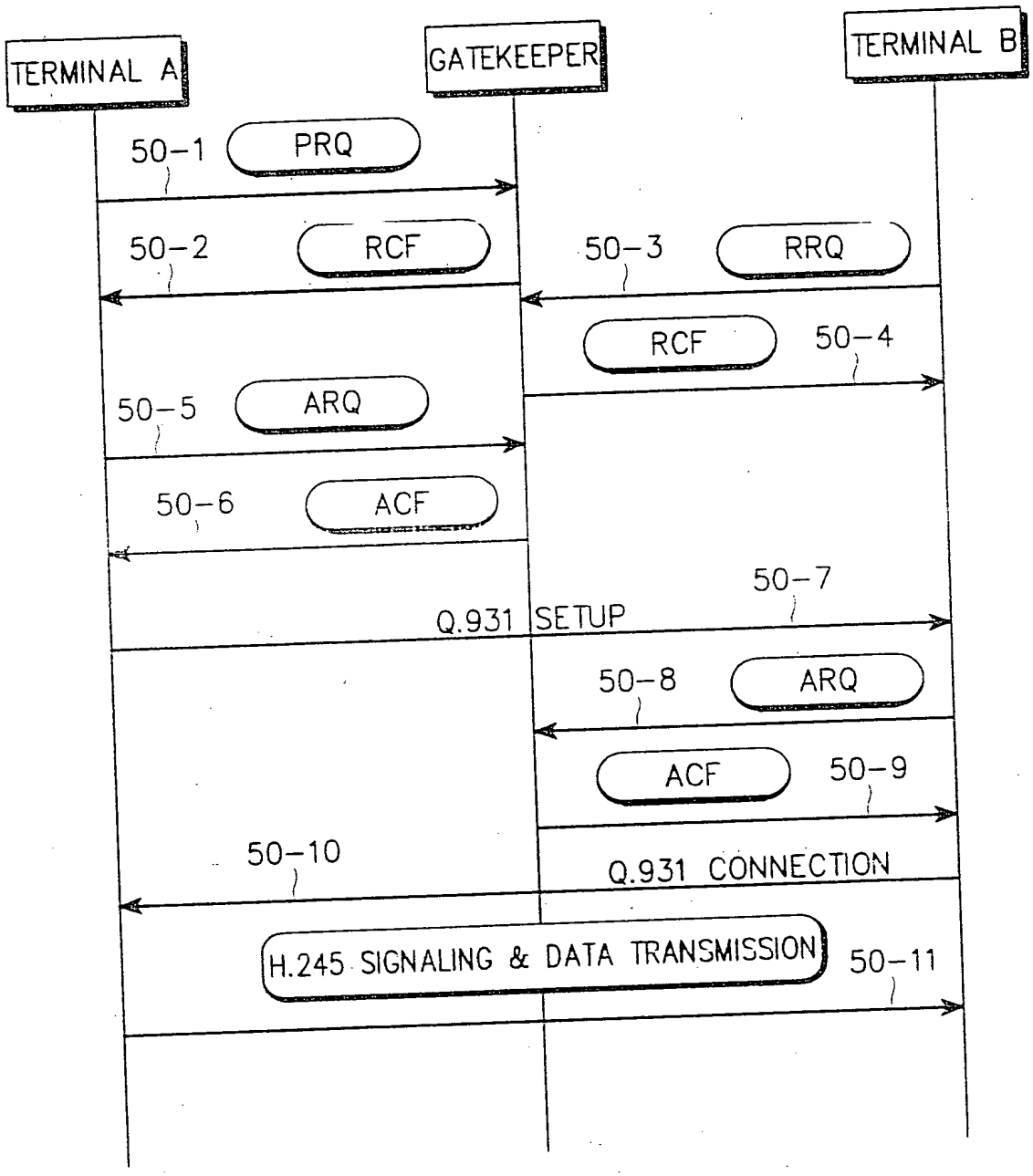
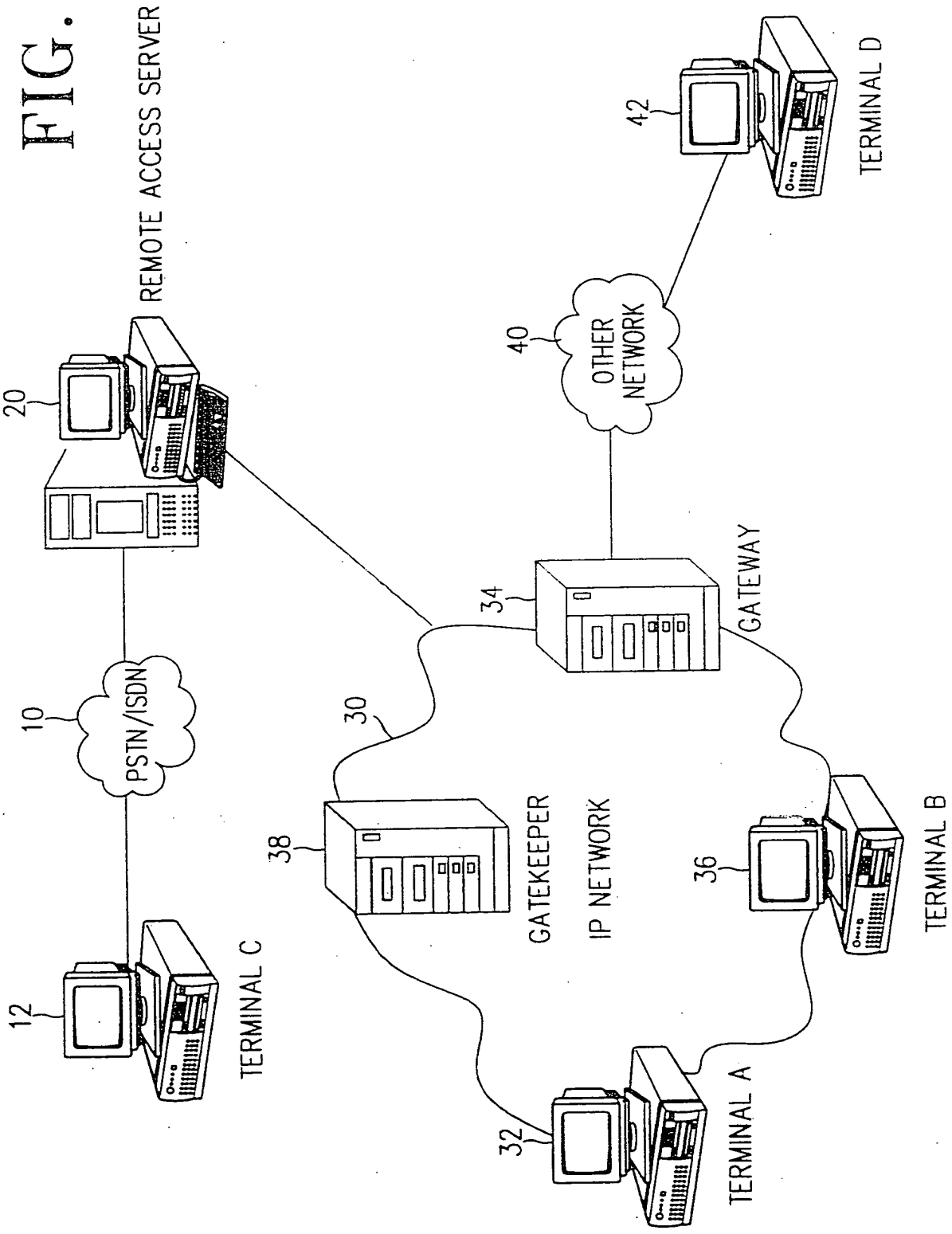

TERMINAL A
GATEKEEPER
TERMINAL B
50-1
PRQ
50-2
RCF
50-3
RRQ
RCF
50-4
50-5
ARQ
50-6
ACF
50-7
Q.931 SETUP
50-8
ARQ
ACF
50-9
50-10
Q.931 CONNECTION
H.245 SIGNALING & DATA TRANSMISSION
50-11

FIG. 3

FIG. 4


REMOTE ACCESS SERVER
20
PSTN/ISDN
10
12
TERMINAL C
30
38
GATEKEEPER
IP NETWORK
34
GATEWAY
40
OTHER NETWORK
42
TERMINAL D
36
TERMINAL B
32
TERMINAL A

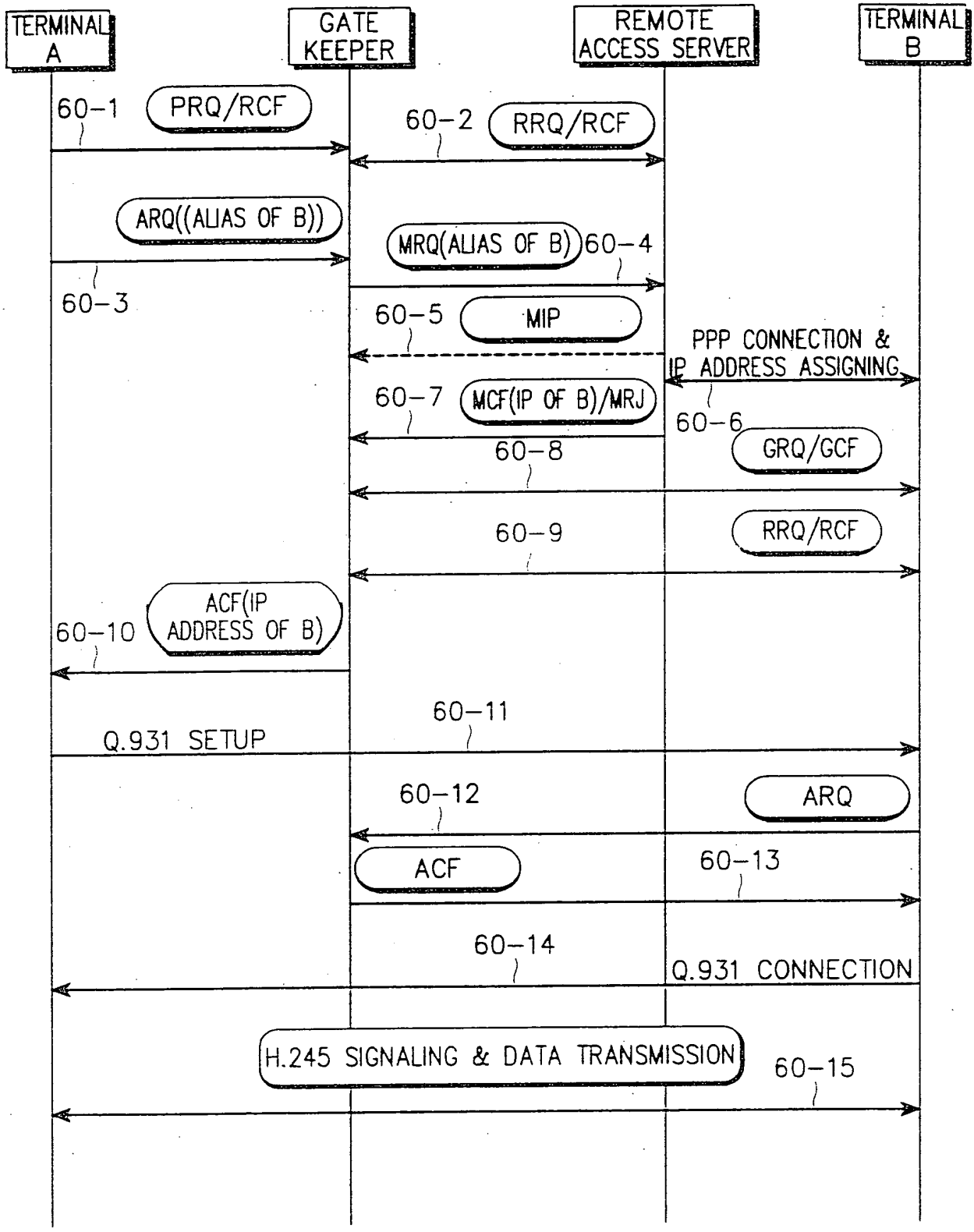

TERMINAL A
GATE KEEPER
REMOTE ACCESS SERVER
TERMINAL B
60-1
PRQ/RCF
60-2
RRQ/RCF
ARQ((ALIAS OF B))
60-3
MRQ(ALIAS OF B)
60-4
60-5
MIP
PPP CONNECTION & IP ADDRESS ASSIGNING
60-7
MCF(IP OF B)/MRJ
60-6
GRQ/GCF
60-8
60-9
RRQ/RCF
ACF(IP ADDRESS OF B)
60-10
60-11
Q.931 SETUP
60-12
ARQ
ACF
60-13
60-14
Q.931 CONNECTION
H.245 SIGNALING & DATA TRANSMISSION
60-15

FIG. 5

[THE SCOPE OF PATENT CLAIMS]

[CLAIM 1]

A method for enabling a first terminal on a packet-based network to communicate with a second terminal accessing a remote access server, comprising the steps of:

registering the aliases and IP (Internet Protocol) addresses of said first terminal and remote access server into the gatekeeper;

letting said first terminal send to said gatekeeper a message for requesting a connection with said second terminal;

causing said gatekeeper to request said remote access server to connect with said second terminal even not registered in said gatekeeper;

causing said remote access server to request said second terminal to register its alias and IP address in said gatekeeper; and

establishing communication between said first and second terminals through said gatekeeper.

[CLAIM 2]

A method as defined in Claim 1, wherein the step of requesting said remote access server to connect with said second terminal includes the further step of sending a message containing the phone number of said second terminal and a response time limit to said remote access server.

[CLAIM 3]

A method as defined in Claim 1, wherein the step of causing said remote access server to request said second terminal to register comprises the steps of letting said remote access server attempt to connect with said second terminal, notifying said gatekeeper of no available port or said second terminal being busy, notifying said gatekeeper of the IP address assigned to said second terminal connected, letting said second terminal register its alias and IP address in said gatekeeper, and causing said gatekeeper to admit the registration of said second terminal.